WHAT IS CLAIMED IS:

1. A method of manufacturing a semiconductor device, comprising:

forming a metal compound film directly or indirectly on a semiconductor substrate;

forming a metal-containing insulating film consisting of a metal oxide film or a metal silicate film by oxidizing said metal compound film; and

forming an electrode on said metal-containing insulating film.

2. The method of manufacturing a semiconductor device according to claim 1, wherein said metal compound film is formed of a compound that does not bring about a reaction with the semiconductor substrate or with an insulating material positioned below the metal compound film to form a compound.

3. The method of manufacturing a semiconductor device according to claim 1, wherein said metal compound film has a thickness not larger than 5 nm.

4. The method of manufacturing a semiconductor device according to claim 1, wherein formation of said metal compound film and formation of said metal-containing insulating film by oxidation of the metal compound film are repeated a plurality of times.

5. The method of manufacturing a semiconductor device according to claim 1, wherein an insulating film selected from the group consisting of a silicon oxide

film, a silicon nitride film and a silicon oxynitride film is interposed between said semiconductor substrate and said metal compound film.

6. The method of manufacturing a semiconductor device according to claim 1, wherein said metal compound film is selected from the group consisting of a metal nitride film, an oxygen-containing metal nitride film, a silicon-containing metal nitride film, a metal nitride film containing both oxygen and silicon, a metal carbide film, an oxygen-containing metal carbide film, a silicon-containing metal carbide film, a metal carbide film containing both oxygen and silicon, a metal carbonitride film, an oxygen-containing metal carbonitride film, a silicon-containing metal carbonitride film, and a metal carbonitride film containing both oxygen and silicon.

7. The method of manufacturing a semiconductor device according to claim 1, wherein said metal compound film contains at least one metal selected from the group consisting of titanium, zirconium, hafnium, tantalum, niobium, aluminum, yttrium and cerium.

8. The method of manufacturing a semiconductor device according to claim 1, wherein said metal-containing insulating film consists of a plurality of first insulating regions formed of grains containing a metal oxide of a metal element contained in said metal compound film and a second insulating region formed of

an amorphous insulating material in a region except the first insulating regions.

9. The method of manufacturing a semiconductor device according to claim 8, wherein said metal compound film contains a metal element forming said metal oxide and silicon, said first insulating region contains a crystal of said metal oxide, and said second insulating region contains silicon, oxygen and a metal element forming said metal oxide.

10. The method of manufacturing a semiconductor device according to claim 8, wherein said metal compound film contains a first metal element forming said metal oxide and a second metal element differing from said first metal element, said first insulating region contains a crystal of said metal oxide, and said second insulating region contains oxygen and said second metal element.

11. The method of manufacturing a semiconductor device according to claim 8, wherein said metal compound film contains a metal element forming said metal oxide, said first insulating region is formed of crystal grains of said metal oxide, and said second insulating region is formed of an amorphous region of said metal oxide.

12. A semiconductor device, comprising:

a semiconductor substrate;

a metal-containing insulating film formed directly

or indirectly on said semiconductor substrate, said metal-containing insulating film consisting of a plurality of first insulating regions formed of grains containing a metal oxide and a second insulating region formed of an amorphous insulating material in a region except the first insulating regions; and

an electrode formed on said metal-containing insulating film.

13. The semiconductor device according to claim 12, wherein said first insulating region contains a crystal of said metal oxide, and said second insulating region contains silicon, oxygen and a metal forming said metal oxide.

14. The semiconductor device according to claim 12, wherein said first insulating region contains a crystal of said metal oxide, and said second insulating region contains oxygen and a second metal element differing from a first metal element forming said metal oxide.

15. The semiconductor device according to claim 12, wherein said first insulating region is formed of crystal grains of said metal oxide, and said second insulating region is formed of an amorphous region of said metal oxide.

16. The semiconductor device according to claim 12, wherein said metal-containing insulating film further comprises a covering insulating region covering

at least one surface of a main insulating region consisting of said first insulating regions and said second insulating region and formed of an amorphous insulating material equal to that constituting said second insulating region.

17. A semiconductor device, comprising:

a first metal oxide film formed directly or indirectly on a semiconductor substrate;

a second metal oxide film formed on said first metal oxide film; and

a gate electrode formed on said second metal oxide film,

wherein, the decrease of the Gibbs free energy at the time when a metal constituting the gate electrode forms an oxide is larger than that at the time when a metal constituting the first metal oxide film forms an oxide, and the decrease of the Gibbs free energy at the time when a metal constituting the second metal oxide film forms an oxide is larger than or equal to that at the time when the metal constituting the gate electrode forms an oxide.

18. The semiconductor device according to claim 17, wherein said second metal oxide film is selected from the group consisting of a titanium oxide film, a zirconium oxide film, a hafnium oxide film, a tantalum oxide film and a niobium oxide film, and said gate electrode is selected from the group consisting of

a titanium nitride film, a zirconium nitride film, a hafnium nitride film, a tantalum nitride film and a niobium nitride film.

19. A semiconductor device, comprising:

a semiconductor substrate having a trench;

a metal-containing insulating film consisting of a metal oxide film or a metal silicate film and formed along the inner surface of said trench, said metal-containing insulating film constituting a gate insulating film; and

a gate electrode formed on said metal-containing insulating film,

wherein a thickness A of said metal-containing insulating film in the center of the bottom portion, a thickness B of the metal-containing insulating film in the center of the side wall portion, and a thickness C of the metal-containing insulating film at the corner portion along a line joining the intersection between the bottom portion and the side wall portion of said trench and the intersection between the upper surface and the side wall surface of the metal-containing insulating film meet the relationship $C^2 > (A^2 + B^2)$.

20. A semiconductor device, comprising:

a semiconductor substrate;

a gate insulating film formed on said semiconductor substrate;

a gate electrode formed on said gate insulating

film;

a side wall insulating film formed along a side wall of said gate electrode;

a metal oxide film formed on the upper surface of said gate electrode;

diffusion layers formed within those portions of the semiconductor substrate which are positioned on both sides of the gate electrode;

source-drain regions formed on said diffusion layers and in contact with said side wall insulating film; and

silicide films formed on said source-drain regions, the upper surface of said silicide film being substantially flush with the upper surface of said metal oxide film.